

Last Update : 15/10/2020

● SKILLS

● Techniques

- Physics, Mechanics of Fluids and Complex Materials, Heat and Mass Transfer, Turbulence, Rheology, Adsorption and Tribology.
- Numerical Analysis, Numerical Modeling, Topology Optimization, Fluid/Structure Interaction, CFD, Numerical Methods, IBM, The Finite Volume Method, ODE, PDE, Non-linear Programming, Convex Analysis, Adjoint Methods, Development of computational codes in CFD, User-Machine Interfaces.
- Artificial Intelligence, Deep and Machine Learning
- Microscopy, Rheometry, Normal Stresses, Suspensions of Particles, and Migration.

● Communications

- Coordination and management of R&D projects
- National and International scientific collaborations
- Bibliographical Research
- Writing of advanced technical and progress reports
- Interaction with academia and industry
- International Conferences and scientific publications in high-impact journals (see next page)
- Reviewer of many scientific journals (i.e. JFM, JNNFM, PoF, SAMO, JHMT, CEJ, ChERD, Energy, ATE, etc)

● Informatics

- Linux®.
- C++®, C®, Fortran®, Python®.
- OpenFOAM®, StarCCM+®, gmsh®.
- FreeCAD®.

● Languages

- Arabic (*Native*)
- English (fluent)
- French (fluent)
- Scientific English

● PROFESSIONAL EXPERIENCE

April 2020 - Present Nicosia, Cyprus	Senior Researcher, University of Nicosia Advanced Computational Multi-Physics
Sept. 2014 – March Douai	Associate Professor (HDR): IMT Lille Douai Topology Optimization in CFD, Fluid Mechanics and Heat Transfer.
Sept. 2013 – Aug. 2014 St-Paul-Lez-Durance	PostDoc: IRSN - Saint Paul Lez Durance Rheology of immersed granular materials in presence of Hydrodynamic interactions.
Jan. 2012 – June 2013 Sophia Antipolis	PostDoc: CEMEF - Mines ParisTech ↔ Arcelormittal Study and Development of scientific calculation codes (Fast-Models) for industrial strip rolling processes with lubrication.
Oct. 2008 – Dec. 2011 Nice	PhD thesis : LPMC UMR - CNRS 7336 Rheology of concentrated suspensions and shear-induced particles migration.
Mar. 2008 – Sept. 2008 Nantes	Master II R&D : LTN - Ecole Polytechnique de Nantes Liquid-Liquid Dispersion and Chaotic Advection in Heat Exchangers.

● DIPLOMAS

- Nov. 2019 :** **HDR (Habilitation à Diriger des Recherches)**
Topology Optimization of complex thermofluid flows and systems:
multiphysics, multiscale, modeling and design.
[University of Polytechnique Hauts-de-France](#)
- Dec. 2011 :** **PhD in Physics**
University of Nice Sophia Antipolis, France. [Cote d'Azur University](#) member.
Laboratory of Physics of Condensed Matter (LPMC) UMR CNRS 7336.
- Oct. 2008 :** **Master II Research in Heat-Energy**
University of Nantes, École centrale de Nantes, nantes, France.
Thermokinetics laboratory UMR CNRS 6607.
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● SCIENTIFIC PUBLICATIONS & COMMUNICATIONS

Scientific Publications

- **T. DBOUK**, D. DRIKAKIS, “Weather impact on airborne coronavirus survival”, *Physics of Fluids*, 32, 093312, (2020).
<https://doi.org/10.1063/5.0024272>
- **T. DBOUK**, D. DRIKAKIS, “On respiratory droplets and face masks”, *Physics of Fluids*, 32, 063303, (2020).
<https://doi.org/10.1063/5.0015044>
- **T. DBOUK**, D. DRIKAKIS, “On coughing and airborne droplet transmission to humans”, *Physics of Fluids*, 32, 053310, (2020). <https://doi.org/10.1063/5.0011960>
- **T. DBOUK**, S.A. BAHRANI, “Modeling of buoyancy-driven thermal convection in immersed granular beds”, *International Journal of Multiphase Flows*, 134, 103471, (2020). <https://doi.org/10.1016/j.ijmultiphaseflow.2020.103471>
- G. WANG, **T. DBOUK**, D. WANG, Y. PEI, X. PENG, H. YUAN, S. XIANG, “Experimental and numerical investigation on hydraulic and thermal performance in the tube-side of helically coiled-twisted trilobal tube heat exchanger”, *International Journal of Thermal Sciences* 153, 106328, (2020). <https://doi.org/10.1016/j.ijthermalsci.2020.106328>
- H. KARKABA, **T. DBOUK**, C. HABCHI, S. RUSSEIL, T. LEMENAND, D. BOUGEARD, Multi objective optimization of vortex generators for heat transfer enhancement using large design space exploration, accepted for publication, **Chemical Engineering and Processing - Process Intensification**, June (2020).
- **T. DBOUK**, C. HABCHI, “On the mixing enhancement in concentrated non-colloidal neutrally buoyant suspensions of rigid particles using helical coiled and chaotic twisted pipes: A numerical investigation”. **Chemical Engineering and Processing - Process Intensification**, 141, (2019).
- **T. DBOUK**, “**AdsorpReactingFoam®**, a computational platform for multicomponent adsorption and reactive flows in OpenFOAM®”, under review (2020).
- **T. DBOUK**, “VOC pollutants reduction in indoor-environment by adsorptive materials and fresh air ventilation: CFD scenarios modeling, simulation and validation in OpenFOAM®”, under review (2020).
- C. OCTAU, **T. DBOUK**, M. WATREMEZ, D. MERESSE, M. LIPPERT, J. SCHIFFLER, L. KEIRSBULCK, L. DUBAR, “Liquid-solid two-phase jet in a turbulent crossflow: Experiments and simulations”, accepted for publication, Dec. 2019.
- **T. DBOUK**, “A computational framework with an adaptive mesh refinement technique for concentrated suspension flows”. **Particulate Science and Technology**, 1-10, (2019).
- H. BELKHOUA, S. RUSSEIL, **T. DBOUK**, M. MOBTIL, D. BOUGEARD, N.-Y. FRANCOIS, “Large Eddy Simulation of boundary layer transition over an isolated ramp-type micro roughness element”, **International Journal of Heat and Fluid Flow**, 80 (2019).
- S.A. BAHRANI, J.F. MORRIS, **T. DBOUK**, “Déstabilisation en mode séquentiel d’un lit granulaire immergé par une source thermique”, **Proceeding CIFQ** (2019).

- **T. DBOUK**, A new technology for CPU chip cooling by concentrated suspension flow of non-colloidal particles. **Applied Thermal Engineering**, 146, 664-673, 5 January (2019). DOI: <https://doi.org/10.1016/j.applthermaleng.2018.10.044>
- **T. DBOUK**, "Heat transfer and shear-induced migration in dense non-Brownian suspension flows: Modelling and simulation", **Journal of Fluid Mechanics**, volume 840, (2018). DOI: <https://doi.org/10.1017/jfm.2018.72>
- V. SUBRAMANIAM, **T. DBOUK**, J.-L. HARION, "Topology optimization of conjugate heat transfer systems: A competition between heat transfer enhancement and pressure drop reduction", **International Journal of Heat and Fluid Flow**, 75, (2019), 165-184. DOI: <https://doi.org/10.1016/j.ijheatfluidflow.2019.01.002>
- V. SUBRAMANIAM, **T. DBOUK**, J.-L. HARION, "Topology optimization of conductive heat transfer devices: An experimental investigation", **Applied Thermal Engineering**, 131, 390-411, (2018). DOI: <https://doi.org/10.1016/j.applthermaleng.2017.12.026>
- R. GAUTIER, **T. DBOUK**, M.A. CAMPESI, L. HAMON, J.-L. HARION and P. PRÉ, "Pressure-swing-adsorption of gaseous mixture in isotropic porous medium : Transient 3D modeling and validation", **Chemical Engineering Journal**, 348, 1049-1062, (2018). DOI: <https://doi.org/10.1016/j.cej.2017.05.145>
- R. GAUTIER, **T. DBOUK**, J.-L. HARION, L. HAMON and P. PRÉ, "Pressure-swing-adsorption of gaseous mixture in isotropic porous medium: Numerical sensitivity analysis in CFD", **Chemical Engineering Research and Design**, 129, 314-326, (2018). DOI: <https://doi.org/10.1016/j.cherd.2017.11.007>
- V. SUBRAMANIAM, **T. DBOUK**, J.-L. HARION, "Thermal Measurements in Conductive Heat Transfer Tree-Like Structures Obtained by Topology Optimization", **Proceeding** 3rd International Conference on Experimental and Numerical Flow and Heat Transfer (ENFHT'18), 12-14 April, (2018), Budapest, Hungary.
- H. BELKHOUCHE, S. RUSSEIL, **T. DBOUK**, M. MOBTIL, D. BOUGEARD, N. FRANÇOIS, "Influence of surface roughness elements on heat transfer in transitional flows: a cfd investigation", **proceeding** XI International Conference on Computational Heat, Mass and Momentum Transfer, Cracow, Poland, May 21-24 (2018).
- **T. DBOUK**, "A review about the engineering design of optimal heat transfer systems using topology optimization", **Applied Thermal Engineering**, Vol 112, pp 841–854, (2017). DOI: <http://dx.doi.org/10.1016/j.applthermaleng.2016.10.134>.
- V. SUBRAMANIAM, **T. DBOUK**, J.-L. HARION, Optimisation topologique de composants conducteurs de chaleur: étude expérimentale. **Proceeding** 25^{ème} Congrès Français de Thermique, Marseille, du 30 Mai au 2 Juin (2017).
- C. OCTAU, M. LIPPERT, **T. DBOUK**, A. GRAZIANI, M. WATREMEZ, L. KEIRSBULCK and L. DUBAR, Particles transport in railway braking systems: an experimental and numerical investigation. **Proceeding** of the ASME 2017 Fluids Engineering Division Summer Meeting, July 31-August 3, (2017), Waikoloa, Hawaii, USA.
- C. OCTAU, M. LIPPERT, **T. DBOUK**, M. WATREMEZ, L. KEIRSBULCK, L. DUBAR, Etudes expérimentales et numériques d'un jet de particules : application au freinage ferroviaire. **Proceeding** 23^{ème} Congrès Français de Mécanique, Lille, du 28 Août au 1er Septembre (2017).
- R. GAUTIER, **T. DBOUK**, L. HAMON, P. PRÉ, D. BOUGEARD, Intensification d'un procédé de séparation de gaz par adsorption: étude numérique par simulations CFD 3D et influence de la géométrie du lit adsorbant. **Proceeding** 16^{ème} Congrès de la Société Française de Génie des Procédés, Nancy, du 11 au 13 Juillet (2017).
- **T. DBOUK** "A Suspension Balance Direct-Forcing Immersed Boundary Model for wet granular flows including obstacles", **Journal of Non-Newtonian fluid Mechanics**, 230, 68-79 (2016), <http://dx.doi.org/10.1016/j.jnnfm.2016.01.003>
- **T. DBOUK**, F. PERALES, F. BABIK and R. MOZUL "A DF-IBM/NSCD coupling framework to simulate immersed particle interactions", **Comput. Methods Appl. Mech. Engrg.** 309 (2016) 610–624. <http://dx.doi.org/10.1016/j.cma.2016.05.041>
- M.-A. CAMPESI, R. GAUTIER, **T. DBOUK**, O. MOUSSA, L. HAMON, F.-X. BLANCHET, Y. GOURIOU, J.-L. HARION and P. PRÉ, Study of a novel heat exchanger adsorber concept for CO₂ capture, Physical and Chemical Phenomena in Heat Exchangers and Multifunctional Reactors for Sustainable Technology, **Proceeding** of Eurotherm Seminar 106, 10-11 Oct. (2016) Paris, France.
- **T. DBOUK** and J.-L. HARION "Performance of Optimization Algorithms Applied to Large Nonlinear Constrained Problems", **American Journal of Algorithms and Computing** (2015) Vol. 2 No. 1 pp. 32-56.

- **T. DBOUK**, P. MONTMITONNET, N. SUZUKI, Y. TAKAHAMA, N. LEGRAND, T. NGO and H. MATSUMOTO "Advanced roll bite models for cold and temper rolling processes", **La Metallurgia Italiana**, 4, (2015).
- F. PERALES, F. DUBOIS, Y. MONERIE, R. MOZUL, F. BABIK, **T. DBOUK** and R. MONOD, "Xper : une plateforme pour la simulation numérique distribuée d'interactions multiphysiques entre corps", **Proceeding** 12e Colloque National en Calcul des Structures, CSMA (2015).
- **T. DBOUK**, P. MONTMITONNET, N. LEGRAND "Two-dimensional Roll Bite Model with lubrication for Cold Strip Rolling", **Advanced Materials Research** Vols. 966-967 (2014) pp 48-62.
- **T. DBOUK**, P. MONTMITONNET, H. MATSUMOTO, N. SUZUKI, Y. TAKAHAMA, N. LEGRAND, and T. NGO, "Advanced Roll Bite Models for Cold and Temper Rolling Processes", **Proceeding** of 9th International & 6th European Rolling Conference, Venice, Italy, June (2013).
- **T. DBOUK**, L. LOBRY, E. LEMAIRE, and F. MOUKALLED, "Shear-induced Particles Migration: Predictions from Experimental Determination of The Particle Stress Tensor", **Journal of Non-Newtonian fluid Mechanics**, 198, pp. 78-95, August (2013). <http://dx.doi.org/10.1016/j.jnnfm.2013.03.006>
- **T. DBOUK**, L. LOBRY, E. LEMAIRE, "Normal stresses in concentrated non-Brownian suspensions", **Journal of Fluid Mechanics**, Volume 715, pp 239-272, January (2013). <http://dx.doi.org/10.1017/jfm.2012.516>.
- **T. DBOUK**, L. LOBRY, E. LEMAIRE, "Différences de contraintes normales dans les suspensions non-browniennes concentrées", **Proceeding** 20ème Congrès Français de Mécanique, Besançon, (2011).
- **T. DBOUK** "Rheology of concentrated suspensions and shear-induced particles migration", PhD thesis in Physics (December 2011), University of Nice-Sophia Antipolis, LPMC UMR - CNRS 7336, Nice, France.

Scientific Communications (Oral and/or Poster)

- 16-19 June 2019, CIFQ, CANADA (2019) "Déstabilisation en mode séquentiel d'un lit granulaire immergé par une source thermique" (**Oral**)
- 12-13 June 2019, 4th French OpenFOAM® users conference, Marseille, France. "Buoyancy-driven instability of immersed granular bed of micro-particles". (**Oral**)
- 11 June 2018, ECCOMAS, ECCM 6, ECFD7, Glasgow, UK. Multiobjective topology optimization applied to conjugate heat transfer problem. (**Oral**)
- 23-24 May 2018, 3rd French OpenFOAM® users conference, Valenciennes, France. "Research and development activities using OpenFOAM at the Energy Engineering Department of IMT Lille Douai". **Oral**
- 21-24 May 2018, XI-th International Conference on Computational Heat, Mass and Momentum Transfer (ICCHMT). Cracow, Poland. "Influence of surface roughness elements on heat transfer in transitional flows: a cfd numerical investigation". **Poster**
- 16 May 2018, Journée thématique (*Thermique dans les écoulements de fluides complexes*), Société Française de thermique (SFT), "Heat transfer and shear-induced migration in dense non-Brownian suspension flows: Modelling and Simulation". **Oral** (Invited Speaker).
- 07 November 2017, Journée Jeunes Chercheurs 2017 (JJC'17) – GEPROC UgéPE, Douai, France. "Infrared Thermal Measurements in Conductive Heat Transfer Tree-Like Structures Obtained by Topology Optimization" . **Poster**
- 07 November 2017, Journée Jeunes Chercheurs 2017 (JJC'17) – GEPROC UgéPE, Douai, France. "Optimisation de forme d'un adsorbent échangeur de chaleur" . **Poster**
- 07 November 2017, Journée Jeunes Chercheurs 2017 (JJC'17) – GEPROC UgéPE, Douai, France. "Intensification du transfert de chaleur dans les échangeurs embarqués par structurations de surface" . **Poster**
- 30 May - 02 June 2017, 25ème Congrès Français de Thermique, Marseille, France. "Optimisation topologique des composants conducteurs de chaleur: étude expérimentale". **Oral + Poster**

03 May **2017**, Invited Speaker, Scientific Seminar, Notre Dame University, Zok Mosbeh, Beirut, Lebanon. "Gas separation in packed bed of adsorbing porous medium: Modeling and Simulation". **Oral**

28 April **2017**, IMT National Conference, Colloque « L'énergie en révolution numérique », Paris, France. "Numerical optimization platform developments for designing optimal heat exchangers". **Poster**

24 April **2017**, IMT Research Seminar, University of Lille, Villeneuve d'Ascq, France. "Numerical optimization platform developments for designing optimal heat exchangers". **Poster**

21-22 March **2017**, 2ndes journées françaises des utilisateurs de OpenFOAM, Nevers, France. "TOPOF: Topology Optimization Platform in OpenFOAM". **Oral**

30-31 January **2017**, 6èmes Journées de l' Association Française de l'Adsorption, Paris, France. "Simulations numériques 3D d'un procédé de séparation de gaz par adsorption (PSA)". **Oral**

10-11 November **2016**, Invited Speaker, Annual Meeting on Rheology, Alicante, Spain. "Dynamic-Scale Modeling of non Brownian suspensions including suspension/structure interactions". **Oral**

10-11 October **2016**, Eurotherm Seminar 106, Paris, France. Physical and Chemical Phenomena in Heat Exchangers and Multifunctional Reactors for Sustainable Technology, "Study of a novel heat exchanger adsorber concept for CO₂ capture". **Oral**

06 October **2016**, Journée Jeunes Chercheurs 2016 (JJC'16) – GEPROC UGÉPE, Louvain, Belgium. "Topology optimization of conductive heat transfer devices: An experimental investigation". **Poster**

30 June **2016**, Journée des Doctorants 2016 (JDD'16), Douai France. "Topology optimization of conductive heat transfer devices: An experimental investigation". **Poster*** (* : Best Poster Award)

19-23 June **2016**, 5th International Conference on Engineering Optimization, Iguassu Falls, Brazil. "Topology optimization of 2D and 3D heat conduction structures". **Oral**

31 May - 03 June **2016**, Congrès Français de Thermique, Toulouse, France. "Optimisation topologique 3D des systèmes de conduction de la chaleur". **Poster**

18 May **2016**, Journée des utilisateurs OpenFOAM, Rouen, Normandie, France. "Dynamic-Multi-Scale Modeling and Simulation of Immersed Granular Flows over Obstacles". **Oral**

15-17 July **2015**, International conference: 17th British-French-German Conference on Optimization, BFG 2015, Imperial College, London, UK. "An optimization algorithm of high performance for inequality-constrained bounded nonlinear optimization problems". **Oral**

18-22 May **2015**, International conference: 12e Colloque National en Calcul des Structures, CSMA 2015, Presqu'île de Giens (Var), France. "Xper : une plateforme pour la simulation numérique distribuée d'interactions multiphysiques entre corps". **Poster**

09-11 July **2014**, International conference: Modeling Granular Media Across Scales 2014, Montpellier, France. 'Numerical Modeling of the Dynamics of Immersed Granular Materials'. **Oral**

22-24 June **2014**, The 6th International Conference on Tribology in Manufacturing Processes & Joining by Plastic Deformation, Darmstadt, Germany: 'Advanced Roll Bite Models for Cold and Temper Rolling Processes'. **Oral**

5-6 Nov **2013**, Workshop on Numerical Modelling of Grains/Fluid Flows, ENS, Lyon, France: 'A Suspension Balance Model for the flows of non-Brownian Suspensions of hard spheres'. **Oral**

10-12 June **2013**, The 9th International Rolling Conference and the 6th European Rolling Conference, Venice, Italy: 'Advanced Roll Bite Models for Cold and Temper Rolling Processes'. **Oral**

05-10 August **2012**, The 16th International Congress on Rheology, Lisbon, Portugal: 'Normal Stresses in non-Brownian suspension'. **Poster**

23 January **2012**, Les Rencontres Niçoises de Mécanique des Fluides, Laboratoire Jean-Alexandre Dieudonné, Nice, France: 'Rheology of concentrated suspensions and Shear-induced migration'. **Oral**

9-13 October **2011**, 83rd Annual Meeting of the Society of Rheology, Cleveland, Ohio, USA: 'Normal stresses in concentrated non-colloidal suspensions (Experiments and Simulations)'. **Poster**

13-16 June **2011**, 6th OpenFOAM Workshop, Penn state, USA: ‘An Incompressible Multi Phase Solver’. **Oral**

18-19 Nov **2010**, GISEC 2010, Nice, France: ‘[Normal stress measurements in non-Brownian Suspensions](#)’. **Oral**

7-9 April **2010**, 6th Annual European Rheology Conference (AERC), Göteborg, Sweden: ‘Normal stresses in sheared non-Brownian suspensions’. **Oral**

27 Novembre **2009**, le Groupe Français de Rhéologie (GDR MePhy), Paris, France: ‘Measurements of Normal Stresses in sheared Stokesian suspensions’. **Oral**

15-17 April **2009**, 5th Annual European Rheology Conference (AERC), Cardiff, United Kingdom: ‘Particle migration in suspensions flowing between rotating parallel-plates: The role of the secondary flow’. **Poster**

● Projects: Research and Development

Project no.1 (January 2012 – June 2013)

Host Institution: CEMEF, Mines-ParisTech, Sophia-Antipolis, France

Research Topic: Advanced Solver development for simulating the rolling loads in a cold strip rolling process (with lubrication)

Partners: Dr. Nicolas Legrand (Arcelor-Mittal Research, France), Prof. Pierre Montmitonnet (CEMEF, Mines-ParisTech)

Funding: ~90000 euros, Arcelor-Mittal (France)

Project no.2 (September 2013 – September 2014)

Host Institution: CEA-Cadarache, France (IRSN)

Research Topic: Immersed Boundary Methods for nuclear safety applications

Partners: Prof. Frédéric Perales (IRSN, Cadarache, France)

Funding: ~50000 euros, IRSN, France

Project no.3 (April 2015 – April 2016)

Host Institution: IMT Lille-Douai, France

Research Topic: Pressure-swing adsorption of gaseous mixture in isotropic porous medium: Transient 3D Modeling and Validation

Partners: Prof. Jean-Luc Harion (IMT Lille-Douai), Prof. Pascaline Pré (IMT Atlantique, Nantes)

Funding: 104000 euros, Institut Mines-Télécom (France)

Project no.4 (January 2016 – December 2018)

Host Institution: IMT Lille-Douai, France

Research Topic: Topology optimization of conjugated heat transfer devices: experimental and numerical investigation

Partners: Prof. Jean-Luc HARION (IMT Lille-Douai)

Funding: 50000 euros IMT Lille-Douai (ARMINES contract)

Project no.5 (January 2017 – January 2020)

Host Institution: IMT Lille-Douai, Douai, France – Valeo Group, Paris, France

Research Topic: Optimization and Design of innovative heat exchangers

Partners: N.-Y. François (VALEO R, Paris)

Funding: >250000 euros, VALEO R Group Thermal Systems (inside a 6 years Industrial chair NEO (Numerical and Experimental Optimization platform for efficient design of automotive heat exchangers))

Project no.6 (January 2016 – September 2019)

Host Institutions : ALSTOM Research group and LAMIH, University of Valenciennes, France

Research Topic: Particles transport emitted during railway braking systems: experimental and numerical investigations

Partners: Prof. Laurent. Keirsbulck (LAMIH, University of Haut-de-France)

Funding: 250000 euros ALSTOM Research Group (France)

Project no. 7 (September 2019 – April 2020)

Host Institutions : IMT Lille Douai, France – University of Zhengzhou, China

Research Topic: Optimization and Design of innovative heat exchangers

Partners: Prof. Dingbiao Wang, Dr. Guanghui Wang (University of Zhengzhou, China)

Funding: ~20000 euros (Chinese Academy of Sciences)

Project no. 8 (April 2016 – December 2017)

Host Institution: IMT Lille-Douai, Boet-Stopson Research, Lille, France

Research Topic: CFD 3D modeling and simulation of isothermal turbulent fluid flows in industrial silencers: uncertainty and quantification of pressure drop

Partners: Florian DELABRE (Boet-Stopson Research Group)

Funding: 60000 euros, Boet-Stopson R – Lille, France

Project no.9 (September 2018 – December 2020)

Host Institutions: Lebanese International University (LIU)-Lebanon

Research Topic: Design space exploration to find optimal designs of vortex generators for heat transfer enhancement

Partners: C. Habchi (NDU University, Lebanon) and T. Lemenand (Angers University, France)

Funding: 50000 euros, LIU University - Lebanon (50%) and IMT Lille-Douai - France (50%)

Project no.10 (June 2018 – June 2019)

Host Institutions: IMT Lille-Douai, France, EcoTech-Ceram startup (Rivesaltes, France)

Research Topic: Optimization and Design of “plug and play” waste heat storage system (Eco-Stock®)

Partners: Guilhem Dejean (Ecotech-Ceram R&D)

Funding: 50000 euros, BPI Bank, France

● Prizes

Winner of best paper award “Proceeding of 3rd International Conference on Experimental and Numerical Flow and Heat Transfer” (ENFHT’18), 12-14 April, 2018, Budapest, Hungary.

Winner of the prize “Best French PhD Thesis developed with OpenFOAM®”

Association Foam-U, second annual meeting, 21-22 Mars 2017, Nevers, France. <http://www.foam-u.fr/>

Winner of best Poster Award :

30 June 2016, Journée des Doctorants 2016. Authors : V. Subramaniam, T. Dbouk and J.-L. Harion

● Enveloppes Soleau

Year 2017: 3 Enveloppes Soleau

Year 2018: 4 Enveloppes Soleau

Developed Numerical Solvers for R&D purposes

2010/2011: 3D Solver development for immersed granular flows (suspensions of rigid particles immersed in a fluid).

Solver Name: **SbmFoam** (for simple shear flows)

Hyper link: <https://openfoamwiki.net/index.php/Contrib/SbmFoam>

Integration Library: OpenFOAM® Library (C++) - under the GNU (GPL) General Public Licence.

2011/2012: 3D Solver development for immersed granular flows (suspensions of rigid particles immersed in a fluid).

Solver Name: **SbmGeneralFoam** (for general flows)

Hyper link: <http://dx.doi.org/10.1016/j.jnnfm.2013.03.006>

Integration Library: OpenFOAM® Library (C++) - under the GNU (GPL) General Public Licence.

2012/2013: Advanced 2D Solver development for simulating the rolling loads in a cold strip rolling process (with lubrication).

Solver Name: **RollGap®**

Integration Library: Fortran90®.

2013/2014: 3D solver for fluid/structure interactions (wet granular flows) using the immersed boundary method coupled to a non-smooth contacts dynamics method.

Solver Name:	PELICANS_IBM_LMGC
Hyper link:	https://csma2015.ec-nantes.fr/resumes/r_FJFO3RX6.pdf
Integration Library:	Xper: IRSN-LMGC90 research laboratories open source C++/Fortran developed library.
2012/2015:	3D solver for suspension/structure interactions (suspension flows over obstacles) using the immersed boundary method coupled to a suspension balance model.
Solver Name:	SbIBMFoam
Hyper link:	http://dx.doi.org/10.1016/j.jnnfm.2016.01.003
Integration Library:	OpenFOAM® Library (C++) - under the GNU (GPL) General Public Licence.
2014/2015:	Topology optimization 3D solver for designing optimum heat conduction systems.
Solver Name:	TopOptHCFoam
Integration Library:	OpenFOAM® Library (C++) - under the GNU (GPL) General Public Licence.
2017/2018:	3D Solver for quasi-compressible immersed granular flows (suspensions of rigid particles immersed in a fluid) including heat transfer, shear-induced migration and buoyancy effects.
Solver Name:	SBMHTFoam
Integration Library:	OpenFOAM® Library (C++) - under the GNU (GPL) General Public Licence.
2015/2018:	3D Topology Optimization Solver for Multi-Objective Conjugate Heat Transfer Problems (steady laminar flows).
Solver Name:	MOadjOptChtFoamMMA®
Optimization Algorithm :	MMA, GCMMA (Svanberg, 1987; Svanberg, 2002)
Integration Library:	OpenFOAM® Library (C++) - under the GNU (GPL) General Public Licence.
2017/2019:	3D Solver for multicomponent adsorption and reactive flows with heat transfer.
Solver Name:	AdsorpReactingFoam®
Integration Library:	OpenFOAM® Library (C++) - under the GNU (GPL) General Public Licence.
2020:	3D Solver for droplet-mixture impacting a porous surface including multi-type physics interaction.
Solver Name:	DropletImpactReactingParcelFoam®
Integration Library:	OpenFOAM® Library (C++) - under the GNU (GPL) General Public Licence.

Some external scientific collaborations (Institutions)

- City University of New York, USA
- Manhattan College, New York, USA
- Zhengzhou University, China
- IMT Atlantique, Nantes, France
- University of Nantes, Nantes, France
- University of Polytech. Haut-de-France, Valenciennes, France
- American University of Beirut (AUB), Beirut, Lebanon
- Lebanese University, Beirut, Lebanon
- NDU University, Zouk Mosbeh, Lebanon
- LIU University, Beirut, Lebanon

Organization of scientific events

- **Eurotherm Seminar 106**, Physical and chemical phenomena in heat exchanger and multifunctional reactor for sustainable technology, 10-11 October 2016, Paris, France.
<https://eurotherm106.sciencesconf.org/>
 - **9ème Journée des Jeunes Chercheurs**, GEPROC et l'UgéPE, 07 November 2017, Douai, France.
http://conference.mines-douai.fr/GEPROC_UGEPE_2017/
 - **3rd French OpenFOAM® users conference** (Joint Franco/Belgian OpenFOAM users conference), 23-24 May 2018, Valenciennes, France.
<http://foam-u.fr/3rdfrenchopenfoamconf/>
 - **5th French OpenFOAM® users conference**, 13-14 May 2020, Lyon, France.
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Teaching Experience

Label of the course : An Introduction to PINCH Analysis & Process Integration.

Keywords : Pinch Technology; Heat Integration; Exergy; Heat Transfer; Fluid Mechanics;

Training objectives : The main objective from this course is to introduce to Graduate students the Pinch Technology Approach (principles, theory, fundamental concepts and applications). This technique is the most widely used for designing optimized efficient energy systems by saving Energy and both investment and operating costs.

Learning Objectives : The students will be able to :

- Distinguish between exergy, entropy and energy
- Distinguish between efficient and inefficient energy system designs
- Understand the efficient use of energy and the reduction of environmental effects
- Understand the economic potential to improve energy efficiency
- Distinguish between renewable and non-renewable energy resources in an environmental context
- Save Energy and both investment and operating costs by heat recovery in a process design
- Understand the Methodology for minimum energy consumption of processes (PINCH)
- Design thermodynamic efficient processes (precisely : Efficient Heat Exchangers Networks)
- Use Computer Software for doing quick PINCH Analysis and efficient Heat Exchangers Networks

Course material :

- Lecture slides (pdf)
- Exercises
- Computer Software Material (& training) using **ThermOptim®**

Pre-requisites :

- Concepts of Energy, Entropy and Exergy
- Fundamental Thermodynamics Laws
- Cycles of basic energy technologies
- Thermodynamic Machines & Systems

Some of the Course contents :

- Concepts of Energy, Entropy and Exergy : a quick revision
- Thermodynamics Laws : a quick revision
- Calculate thermodynamically feasible Energy and cost targets
- Optimize heat recovery systems
- Size and Integrate a Heat Exchanger into an Existing Exchanger Network
- Identify Cold, Hot, and Utility Streams in a Process
- Extract Data for Process and Utility Streams
- Construct Composite Curves and Grand Composite Curve
- Estimate Minimum Energy Cost Targets
- Estimate Heat Exchanger Network (HEN) Capital Cost Targets
- Estimate Practical Targets for HEN Design
- Design thermodynamic efficient processes (Efficient Heat Exchangers Network)
- Use of a Computer Software for doing PINCH Analysis

Supervision of PhD students

PhD Student no.1: V. SUBRAMANIAM

Topic: Topology Optimization of Conjugated Heat Transfer Devices: Experimental and Numerical Investigation

Funded by: IMT Lille Douai®

Defended : 07 December 2018

PhD Student no.2: H. BELKHOUCHE

Topic: Optimization of Heat Exchangers for Automotive applications (CFD and experiments)

Funded by: VALEO® - Thermal Systems®

Date of defense : 13 December 2019

PhD Student no.3: C. OCTAUCHE

Topic: Particles transport in a railway braking system (modeling, simulations and experiments)

Funded by: ALSTOM®

Defended : 15 November 2019

PhD Student no.4: H. KARKABA

Topic: CFD optimization of vortex generators

Funded by: LIU University® & IMT Lille Douai®

Expected date of defense : January 2021

PhD Student no.5: M. MOAZZEN

Topic: Cooling of electronic components by using non-colloidal suspension flows

Funded by: Région Hauts-de-France & IMT Lille Douai®

Expected date of defense : March 2022

Supervised Postdocs

Postdoc no.1: R. GAUTIER

Topic: Adsorption phenomena modeling and simulation in CFD for gas separation processes

Funded by: IMT Lille Douai®

Period : (April 2015 – April 2016)

Supervised Research Engineers

Research Engineer no.1: M. REZAEI

Topic: Modeling and simulation of pressure drop and noise reduction in industrial silencers

Funded by: Boët-Stopson®, Lille, France

Period : April 2017 – January 2018

Supervised Masters-R students

Masters R Student no.1: T.C. NGUYEN

Topic: Spatial Filters in Topology Optimization

Defended : September 2017

Masters R Student no.2: A. KASSOU

Topic: Modeling and simulation of pollutants in air in an indoor environment

Defended : November 2018

● JURY MEMBER

1- PhD defence of Dr. Florian DUGAST. *Optimisation topologique en convection thermique avec la méthode de Lattice Boltzmann.* University of Nantes, Nantes, France, 15 Oct. 2018.

2- PhD defence of Dr. Walid ABOU HWEIJ. *Numerical simulation of wall-bounded flows through screen-type static mixers.* American University of Beirut, Beirut, Lebanon, 27 Apr. 2020.

3- PhD defence of Dr. Omran ABUSHAMMALA. *Optimal Helical Tube Design for Intensified Heat / Mass Exchangers.* University of Lorraine, Nancy, France, 18 Sep. 2020.

● INTERESTS

Sports: Running, reading, swimming, soccer, ping-pong and cycling. Completed two marathons (nice-cannes marathon 2009, and Paris marathon 2014).

● REFERENCES

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